Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Technical Advisory Council Spectrum Policy Recommendations	)	ET Docket No. 17-340
	)	
	)	

COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance submits these comments in response to the Public Notice issued in the above-referenced proceeding by the Office of Engineering and Technology ("OET"), on behalf of the Technical Advisory Committee ("TAC"), seeking input on spectrum policy recommendations the TAC has made to the Commission.[1/] Wi-Fi Alliance applauds the TAC for initiating this important effort. With increasing pressure to make efficient use of the Nation's limited spectrum resources, it is critical for existing and potential spectrum users to understand how the Commission plans to manage the spectrum to achieve the twin goals of permitting new technologies and protecting existing operations. Development of a clear spectrum policy will aid those efforts.

I. INTRODUCTION

Wi-Fi Alliance®[2/] is a global, non-profit industry association of over 800 leading companies from dozens of countries devoted to seamless interoperability. With technology development, market

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1/ *Office of Engineering and Technology Seeks Comment on Technological Advisory Council Spectrum Policy Recommendations*, Public Notice, ET Docket No. 17-340 (rel. Dec. 1, 2017) ("Public Notice").

2/ Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, Miracast®, and Wi-Fi CERTIFIED Passpoint® , and Passpoint® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, the Wi-Fi ZONE logo, Wi-Fi Aware™, Wi-Fi CERTIFIED HaLow™, Wi-Fi HaLow™, Wi-Fi CERTIFIED WiGig™, Wi-Fi CERTIFIED Vantage™, Wi-Fi Vantage™, Wi-Fi CERTIFIED TimeSync™, Wi-Fi TimeSync™, Wi-Fi CERTIFIED Location™, Wi-Fi CERTIFIED Home Design™, Wi-Fi CERTIFIED Agile Multiband™, Wi-Fi CERTIFIED Optimized Connectivity™, and the Wi-Fi Alliance logo are trademarks of Wi-Fi Alliance.

building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi® worldwide by certifying thousands of Wi-Fi products each year.

The Public Notice states that the TAC has recommended the adoption of a policy statement setting forth spectrum management guidance and principles, based on TAC recommendations.[3/] The TAC will consider the comments submitted in response to the Public Notice and make refinements to its recommendations. Because of the important role Wi-Fi Alliance and its members play in the spectrum ecosystem – including particularly spectrum used on a shared and unlicensed basis – it will be directly affected by the adoption of spectrum management policies. It therefore welcomes this opportunity to address the TAC recommendations.

II. THE FCC MUST CONTINUE TO AFFIRMATIVELY MANAGE THE SPECTRUM ENVIRONMENT

The Commission is the steward of the electromagnetic spectrum – a critical and limited public resource. It must therefore affirmatively manage that resource to maximize its effective use in the public interest. The Communications Act specifically envisions this management function and it is at the core of the Commission's statutory obligations.[4/] As part of that management function, the Commission may reasonably expect that technology will evolve and that those changes in technology may permit new types of spectrum use. Reasonable Commission reliance on technology advances will continue to be a key tool to increase spectrum utilization through innovative new uses of spectrum while at the same time protecting existing operations. The Commission should therefore make clear that it is Commission policy that new operations may be introduced that do not harmfully affect incumbent users that reasonably maintain and upgrade their systems. At the same time, it is unnecessary for the Commission to mandate the use of particular technology or equipment upgrades.

3/ *Public Notice* at 1.

4/ *See,* 47 U.S.C. 303(f).

Operations that do not reasonably migrate to current generation, more spectrum-efficient technologies may simply not be afforded the same level of protections as other operations that do. In any case, the decision to permit the introduction of new or additional spectrum users should be based on transparent criteria that should be periodically reviewed in light of technological advancements, evolving demands and other factors.

III. TAC SPECTRUM MANAGEMENT PRINCIPLES

The Public Notice lists a series of proposed principles for spectrum management, in three categories: Interference Realities (Principles 1-3), Responsibilities of Radio Services (Principles 4-6), and Regulatory Requirements and Actions (Principles 7-9).[5/] Each principle is presented below, along with Wi-Fi Alliance's assessment of that principle.

Principle 1 – Harmful interference is affected by the characteristics of both a transmitting service and a nearby receiving service in frequency, space or time.

Wi-Fi Alliance supports Commission recognition of this principle, which makes the basic assertion that transmitters can cause more or less interference based on their characteristics and receivers can be more or less susceptible to interference based on their characteristics.[6/] Spectrum management can be based principally on this recognition. However, the Commission need not, *a priori, specify* required transmitter or receiver characteristics (other than those basic parameters that are already included in the FCC rules today). Instead, it may and should take a range of equipment capabilities and characteristics (such as receiver sensitivity) into consideration in any evaluation of potential new operations. In evaluating the potential introduction of new technologies using publicly available criteria and principles adopted after public input, the Commission can use reasonable

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5/ *Public Notice* at 2. The principles are also detailed in the TAC's *Basic Principles for Assessing Compatibility of New Spectrum Allocations*, White Paper (Dec. 11, 2015) ("White Paper").

6/ *White Paper* at 8.

assumptions regarding the characteristics and capabilities of equipment to determine the public interest. These assumptions can and should change over time consistent with technological advances.

Principle 2 – All radio services should plan for non-harmful interference from signals that are nearby in frequency, space or time, both now and for any changes that occur in the future.

Wi-Fi Alliance supports this principle, although as noted below, it requires adopting a definition of "non-harmful interference." Any entity that operates, manufacturers or designs systems using radiofrequency equipment must recognize the ever-growing need for spectrum access.[7/] As noted above, the Commission should be permitted, in planning for new entrants, to rely on that required recognition and the parallel obligation for manufacturers and system designers to improve performance. If particular radio system operators fail to reasonably maintain their systems and implement current technologies, they should expect higher levels of interference.

Nevertheless, the Commission's rules do not provide a clear understanding of what constitutes "non-harmful interference."[8/] In order to implement this principle, and provide guidance on how it will manage the potential expansion of spectrum uses, the Commission should address the lack of clarity. This is particularly important for Part 15 devices that, under Commission's rules must accept and may not cause *harmful interference.*[9/]

Principle 3 – Even under ideal conditions, the electromagnetic environment is unpredictable. Operators should expect and plan for occasional service degradation or interruption. The Commission should not base its rules on exceptional events.

Wi-Fi Alliance strongly supports Commission recognition of the principle that radiocommunications systems should be designed with sufficient resiliency to accommodate fluctuations in the electromagnetic environment. Based on the intense demand for spectrum

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7/ *White Paper* at 9 (Noting that "conditions of interference today are unlikely to be the same as they will be in the future").

8/ In contrast, the Commission's rules provides a definition for "harmful interference". *See*, 47 C.F.R. 2.1.

9/ 47 C.F.R. 15.5(b).

resources, existing and future operators should maintain and improve their systems' performance to accommodate new ways to use and share spectrum. All spectrum users must therefore be prepared to work with proponents of new technologies that seek to be introduced, who must similarly work with incumbent users, to ensure that services are not unreasonably disrupted, based on reasonable assumptions which are tested as necessary.

Principle 4 – Receivers are responsible for mitigating interference outside their assigned channels.

As noted above, all spectrum users must take into consideration the spectrum environment, anticipate potential changes to that environment and have an obligation to employ reasonably current technology. However, the Commission should not establish receiver or other technical requirements, beyond what it does today. The assumptions that the Commission makes when it evaluates the potential introduction of new operations should take into consideration reasonably current technologies. Users that do not employ reasonably current technologies – at their own election – will simply not be afforded the same level of protection as services that apply technologically evolved solutions.[10/]

Principle 5 – Systems are expected to use techniques at all layers of the stack to mitigate degradation from interference.

While it is appropriate for the Commission to establish expectations regarding how it will evaluate the potential introduction of new services, the Commission should not dictate how incumbent entities should evolve to accommodate those new technologies. This approach is too prescriptive and reduces the flexibility needed to adapt to emerging technologies; the TAC itself notes that "any form of communication can benefit from at least one" interference mitigation technique,[11/] but that mitigation techniques may involve trade-offs. The Commissions should not

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[10/] The Commission's evaluation of reasonably current technologies should take into consideration the typical useful life of devices and technology evolution for a particular service.

[11/] *White Paper* at 15.

dictate those trade-offs or where in the 'stack' they occur. As the Commission notes, it does not regulate the type of mechanisms that manufacturers employ to mitigate received interference and it should not second-guess manufacturers' decision to use or not use particular mechanisms.[12/]

Principle 6 – Transmitters are responsible for minimizing the amount of their transmitted energy that appears outside of their frequencies and licensed areas.

Wi-Fi Alliance supports Commission adoption of this principle. In most cases, the Commission's rules already prescribe appropriate out-of-band and out-of-area transmit power limits – appropriate tools for limiting interference potential. While Wi-Fi Alliance does not support additional prescriptive technical requirements in order to manage the spectrum, these basic obligations should remain.

Principle 7 – Services under FCC jurisdiction are expected to disclose relevant standards, guidelines and operating parameters of their systems if they expect protection from harmful interference.

Wi-Fi Alliance supports Commission adoption of this principle. As noted below, while new entrants and incumbent users should cooperate in the introduction of new services, it is the Commission's obligation to resolve spectrum management matters. The Commission should establish a set of clear and transparent criteria based on public input regarding how it will evaluate the potential introduction of new services, adjusting those criteria as necessary over time. Wi-Fi Alliance appreciates that the Commission cannot do so if it does not have sufficient information about the services that require protection.[13/] Improved understanding of incumbent services' design and operational parameters will help the Commission evaluate new services in view of those criteria and will help inform potential new entrants about how those services will likely be evaluated. As new technologies are introduced, additional parameters may be developed that will be part of the

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12/ *Public Notice* at 4.

13/ *White Paper* at 19.

evaluation criteria. The Commission should update the type and class of information it obtains as technology improves. Nevertheless, the Commission should not mandate the provision of operating parameters, which would be an overly-regulatory approach. Services should have the choice of providing information – and the Commission can rely on that information in evaluating the introduction of potential new services – or services may assume that the Commission will make reasonable assumptions regarding operating parameters and base its decisions on those assumptions.

Principle 8 – The Commission may apply Interference Limits to quantify rights of protection from harmful interference.

Wi-Fi Alliance supports the introduction of new technologies, and believes that fostering innovation and development must be one of the Commission's primary goals, as should Commission evaluation of how new services will affect existing operations. However, the Commission should not establish a single Interference Limit in its process of evaluating the affect that new services will have and require new entrants to comply with that limit. Establishment of that limit would be unnecessarily restrictive. In furtherance of the Commission's mission, Wi-Fi Alliance believes that the better approach is to establish and announce a set of publicly available criteria and principles for how the Commission will evaluate those new services' impact on incumbent operations, including a clear understanding of what constitutes non-harmful interference. Users and manufacturers – both incumbents and new entrants – can then make the informed decision regarding system design and deployment.

Principle 9 – A quantitative analysis of interactions between services shall be required before the Commission can make decisions regarding levels of protection.

Wi-Fi Alliance strongly supports the Commission's use of transparent and reproducible interference analyses as the basis of determining when to permit the introduction of new services. Those analyses should be based on a set of publicly available criteria and principles adopted after public input that the Commission should use to determine if the proposed service may be

introduced.[14/] Using transparent and reproducible interference analyses should not be limited only to inter-service spectrum sharing decisions, but should also be extended to interactions between specific spectrum users, even when they are in different bands. Nevertheless, as stated above, the analyses that the Commission uses should not be overly burdensome on proposed new services nor unnecessarily delay the introduction of new technologies.

IV. RISK INFORMED INTERFERENCE ASSESSMENT

The Public Notice states that the TAC recommends use of Risk Informed Interference Assessment ("RIIA") to analyze tradeoffs between benefits of a new service and risks to incumbents.[15/] This would involve the Commission, or the relevant bureau, analyzing risks and rewards of new technologies in a systematic, quantitative way, rather than focusing on the worst-case scenarios,[16/] which may not representative of the actual interference risk.[17/] Wi-Fi Alliance supports this approach.

The primary goal of using RIIA is to allow policy-makers at the Commission to make informed evaluations of the public benefit of introducing a new service vs. the potential impact on incumbent services.[18/] The Commission often does not recognize the massive public benefits of providing unlicensed access to spectrum particularly when compared to the marginal impact those devices may have on incumbent users. Use of RIIA will allow the Commission to make that analysis clearer, creating a more compelling case for dedicating additional spectrum for unlicensed use.

14/ *See*, *ibid* at 24.

15/ *Public Notice* at 5.

16/ Federal Communications Commission Technical Advisory Council, *A Quick Introduction to Risk-Informed Interference Assessment* at 3. (Apr. 1, 2015).

17/ *Id.* at 5.

18/ *Id.* at ii.

When evaluating the potential introduction of new services, the Commission cannot make the risk-avoidance bar so high that additional access will always be denied, especially when considering services using spectrum on an unlicensed basis and the public benefits these services offer. Engagement with the Commission and stakeholders, both incumbents and potential new-entrants, should be part of the process in assessing potential additional use of spectrum. This analysis should consider likelihood-consequence combinations for multiple interference hazard scenarios and a more accurate assessment of interference risks from new entrants to a particular band.

V. STEPS FOR IMPROVING INTERFERENCE RESOLUTION AND ENFORCEMENT

The Public Notice states that the TAC recommends potential changes to the Commission's handling of interference disputes.[19/] While many of these recommendations involve the technology used to identify interference, several of the proposals relate to the use of private resources, including private smart-phones and unmanned aerial systems (commonly referred to as 'drones'), to detect interference.[20/] It is unclear from the document how the Commission would use this information, but the TAC document notes that "largely voluntary collaboration and coordination" will resolve and prevent interference.[21/]

Wi-Fi Alliance supports the use of new technologies, but it does not support the use of purely private interference resolution. While much can be done to encourage affected parties to resolve matters without intervention, the Commission is the ultimate arbiter of all interference disputes under the Communications Act.[22/] This responsibility is crucial to the Commission's mission and cannot be

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19/ *Public Notice* at 5.

20/ Federal Communications Commission Technical Advisory Council, *A Study to Develop the Next Generation Systems Architecture for Radio Spectrum Interference Resolution* at 10-11 (Mar. 9, 2016).

21/ *Id*. at 5.

22/ *See*, 47 U.S.C. 303(f).

assigned to private resolution bodies. Not only will maintaining this role keep the Commission in compliance with the Act, it will also ensure that it has a complete and accurate picture of the interference environment as it pursues future rulemakings on spectrum policy. Private action, such as "interference hunters"[23/] and mediation, can only do so much; ultimately, the Commission is responsible for regulating spectrum access in the public interest and must maintain an active role in interference resolution and enforcement.

VI. CONCLUSION

Wi-Fi Alliance applauds the work of the TAC, which recognizes the current crowded spectrum environment and the need for services and manufacturers to plan for the introduction of new technologies while the Commission reasonably protects incumbent operations. The adoption of a spectrum policy statement suggested by the TAC's work, and adjusted to reflect these comments, will be useful in guiding future spectrum management decisions.

Respectfully submitted,

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23/ *Public Notice* at 5.